to support a meager growth of sage brush and cactus,—a fit habitation for the coyote. Only recently has the fact been borne in mind that something is to be found more precious than gold, and from all over the world thousands of invalids flock here. Our people have not realized that California has a cosmopolitan climate adapted to all diseases that can possibly be benefited by change of air; that within its borders are to be found the altitude of the Alps, the scenery of Switzerland, the fruits of the tropics, numerous mineral springs which equal in value and are more healthfully situated than are those of the Eastern United States or Europe; the pure air of the Colorado Highlands and the winter climate of Florida; and that it is a nice question to always properly decide on that location best situated to relieve their particular disease. People do not always choose wisely.

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Article by Henry E. Sigerist of Johns Hopkins.—More recently, in the *Bulletin of the History of Medicine* (Vol. XI, No. 2, February, 1942), the well-known Henry E. Sigerist, M. D., a member of the Johns Hopkins University School of Medicine, discussed the curative aspects of mineral springs in general and those of America in particular. So pertinent are the comments, that liberty is taken to reprint some of his opinions:

To the European physician who comes to America it is very striking to find what little use this country is making of its mineral springs. The situation is so totally different from that which prevails in Europe that it calls for an analysis. . . .

Medicinal springs and their curative powers are mentioned by ancient and mediaeval medical writers. . . .

The European spas have been used for over 2,000 years. Medical theories changed. . . .

But whatever the theories were, patients for over 2,000 years went to the spas, bathed in their waters, drank them and found relief. Every medical theory was used to explain the effect of medicinal waters. The explanations changed, but there were always results. In every century patients were benefited by their cures. . . .

It is very unscientific to deny the experience of 2,000 years merely because we have no ready-made theory that explains all phenomena in every detail. It would have been foolish to deny the existence of lightning because electricity was not yet known. Experience has preceded science in medicine more than once. Our most valuable drugs, quinine, digitalis, opium, mercury and many others were given for centuries, long before pharmacology was able to explain their action. Oskar Baudisch has very pertinently shown how similar the situation was with regard to heliotherapy. Sunlight was used as a healing agent for centuries. Rickets were treated with ultraviolet rays. To "scientific physicians" this was a mere superstition—until the vitamins were discovered and it was found that sunlight changes the ergosterol of the skin into vitamin D. Chemistry until recently was gross chemistry; microchemistry is in its infancy still, and we are beginning to realize that a few molecules of a chemical compound can cause definite biological reactions. . . .

I would like to make a strong plea for the development of our American health resorts. We need them, not because European resorts are unavailable at the moment. There is no reason why our patients should have to go to Europe for such treatments. We need them because the chronic diseases, the diseases of mature and old age are in the foreground, our major health problems today. We shall need them badly after the war, not only for the veterans of the armed forces, but also for the veterans of labor. . . .

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California's Mineral Springs Deserve Promotion.—The 400 or more mineral springs of California are among the great natural resources of the State, still awaiting development. The California State Chamber of Commerce, during the last four years has placed the subject on the program of one of its Sections, the writer having presented three addresses on the topic. Two years ago, a "League for the Development of California's Mineral Springs" was formed, to aid in the work. It was hoped that a movement such as the Redwood League might be started, through which some of California's major forest attractions were saved from destruction.

This year, with the 55th Legislature in session, it has been possible to bring about the adoption of the joint resolution which appears elsewhere in this issue. A perusal of the resolution indicates its purpose:—to urge the constituted Federal authorities to use one or more of California's mineral springs areas as reservations on which could be erected hospital structures, so that spa therapy of scientific standards may be made available to wounded and sick soldiers and sailors, whose convalescence would thereby be promoted and expedited.

If California's mineral springs can so be developed with spa environments in accord with the best experience and standards, their fame will bring thousands of additional visitors to the State, to the benefit not only of the patients, but to the material and other interests of the Commonwealth.

California medicine would profit greatly through the establishment of such institutions. It is hoped that increasing interest will be given to the subject by physicians.

EDITORIAL COMMENT†

ANTIMALARIAL VACCINE AND SERUM THERAPY

An important contribution to the basic theory of antimalarial immunity is contained in a study of the efficacy of prophylactic injections of nonviable malarial sporozoites, currently reported by Russell and Mohan,[1] of the Pasteur Institute, Coonoor, India.

The animals used in this study were domestic fowls inoculated with Plasmodium gallinaceum. Each fowl was infected by the bites of two Aëdes albopictus mosquitoes, which had ingested an infective blood meal 15 days previously. The insects were maintained at 80° F and 80 per cent humidity during the 15-day period. All normal

† This department of CALIFORNIA AND WESTERN MEDICINE presents editorial comments by contributing members on items of medical progress, science and practice, and on topics from recent medical books or journals. An invitation is extended to all members of the California Medical Association to submit brief editorial discussions suitable for publication in this department. No presentation should be over five hundred words in length.

birds thus bitten developed parasites in the blood after a prepatent period of from 8 to 10 days, the average incubation period being 9.1 days. The percentage of infected red blood cells averaged less than 1 per cent at this time, increasing to 11 per cent by the 12th day, to 35 per cent by the 14th day, and to 62 per cent on the day of death, death usually taking place by the 20th day. The mortality rate varied from 40 to 100 per cent in the different groups, averaging 55.4 per cent in all groups. In nonfatal cases the parasite count usually reached its maximum between the 12th and 18th day, and then decreased, the blood becoming free of parasites by the 24th day.

Nonviable vaccines were prepared from ground dried thoraces of mosquitoes that had taken an infective blood meal 15 days previously. Each fowl received five intravenous injections at 5-day intervals of a saline suspension of 40 emulsified thoraces. In each case the agglutinating titer of the fowl's serum for homologous sporozoite suspensions rose to an average of 1:100.000 by the day of experimental inoculation. Following the bites of two infected mosquitoes, parasites appeared in the blood of all vaccinated birds. Less than 1 per cent counts were recorded on the 8th and 10th day, increasing to from 5 to 13 per cent infection by the 12th to 14th day. In 70 per cent of the vaccinated fowls the count then decreased, full recovery being recorded by the 20th day. In 30 per cent of the vaccinated birds the count continued to rise to about 60 per cent by the 14th day, death occurring on the following day. The average maximum count in all vaccinated birds was 20 per cent, as contrasted with a 43 per cent average in the nonvaccinated controls. The mortality rate of 30 per cent is also in contrast with the control mortality rate of 55.4 per cent. Both mortality and severity of the infection were thus reduced one-half as a result of prophylactic immunization. In no case, however, was the infection prevented by the sporozoite vaccine nor the incubation period appreciably prolonged.

Supplementing their study of active immunization, Russell tested the efficiency of a passive transfer of acquired malarial immunity. A group of normal fowls were each given 7 daily intraperitoneal injections of 1 c.c. of pooled serum from a number of fowls having chronic malaria due to homologous plasmodium. After the third immune serum injection, each fowl was bitten by two infective mosquitoes. All contracted malaria. The average latent period was 8.2 days, as contrasted with 9.1 days in the control birds. The mortality rate was reduced to 25 per cent.

Tests were also made of the possibility of combining both active and passive immunization. A number of fowls were given routine doses of the sporozoite vaccine, and afterwards injected intraperitoneally or intravenously with pooled serum from fowls having chronic homologous malarial infections. The pooled serums had an average sporozoite agglutinating titer of 1:180,000. Each fowl was afterwards bitten by two infectious mosquitoes. The combined data from all series thus tested showed an average mortality rate of less than 10 per cent. In no cases, however, was the disease prevented by this combined immunization nor the latent period appreciably prolonged.

The fact that in no case in Russell's multiple tests was malarial infection prevented by active, passive or combined immunization, suggests that immunoprophylaxis is of little or no promise in the epidemiological control of malaria. Although both severity and mortality were reduced as a result of active or passive immunization, the clinical results were not superior to those obtained with routine antimalarial drugs. The work is being continued largely for its theoretic interests.

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AVITAMINOTIC HYPERTENSION

A challenging new theory of the mechanism of renal hypertension is suggested by Calder,[1] of the Clayton Foundation for Research, Duke University, in his recent demonstration of the causal relationship between persistent arterial hypertension and vitamin B_2 deficiency.

The discovery by Goldblatt[2] that experimental renal ischemia is followed by persistent arterial hypertension has led to a generally accepted theory as to the mechanism of renal hypertension. According to this theory,[3, 4] incomplete oxidation of amino acids in the ischemic kidney leads to the formation of intermediary pressor-amines, which in the normal kidney are completely oxidized to nonpressor end-products. The effective etiologic mechanism, therefore, is a diminished oxidative capacity of the kidney. If so, intermediary pressor-amines should also be formed as a result of any other factors reducing the oxidative capacity of the kidney parenchyma. It is generally accepted that the vitamin B complex furnishes essential components of several respiratory enzymic systems. It would logically follow, therefore, that vitamin B deficiency might cause a sufficient decrease in the oxidative capacity of the kidney to give rise to the same hypertensive amines.

To test this possibility Calder maintained numerous groups of rats on various B deficiency diets, and recorded the weekly changes in blood pressure, the experiments usually extending over a period of from 2 to 4 months. In most cases the blood pressure was estimated by the Williams[5] indirect method. In a few animals the pressure was also determined directly by inserting a cannula into the abdominal aorta. The two methods gave practically identical results.

Among Calder's most significant data are his studies of the effects of partial or complete deprivation of "vitamin B_2 complex." This he de-